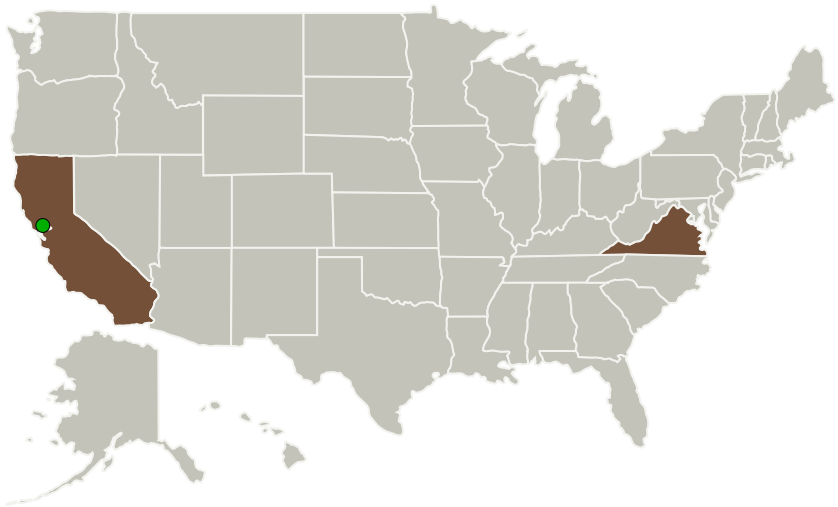
Integrated Design and Analysis Environment for Safety Critical Human-Automation Systems, Phase I

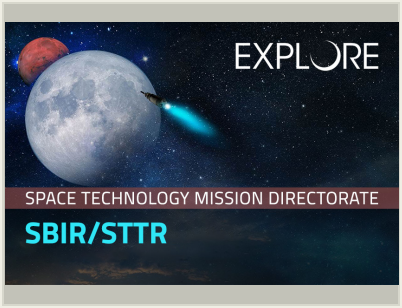
Completed Technology Project (2010 - 2010)

Project Introduction

Flight deck systems, like many safety critical systems, often involve complex interactions between multiple human operators, automated subsystems, and physical structures. Individual components are extensively evaluated and are often redundantly deployed, so catastrophic failures predominately arise not through component failure but as the result of a sequence of failures that cascade because of some unforeseen combination of off-nominal conditions. Such sequences may involve human operators, control algorithms, software implementations, physical structures, and other components of the system. Analyzing the potential for these failure scenarios is extremely difficult, not only because of the inherent complexity of such systems but also because of the multidisciplinary nature of the system itself. While many development tools exist to conduct deep analyses within individual disciplines, there is a lack of tools available for deep analysis of complex multidisciplinary designs. The goal of this proposed research project is thus to create a new class of development tool that allows designers to specify, design, integrate, and conduct analyses of complex systems across disciplinary boundaries. Through this new tool, the dynamic interactions between system components in the presence of off-nominal conditions can be explored to uncover systemic vulnerabilities, precursory conditions, and likely outcomes.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Barron Associates, Inc.	Lead Organization	Industry	Charlottesville, Virginia
Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations	
California	Virginia

Project Transitions

January 2010: Project Start

July 2010: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139921)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Barron Associates, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Michael D Devore

Co-Investigator:

Michael Devore

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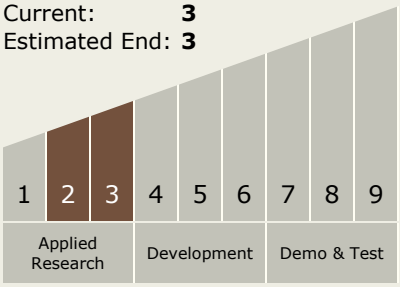
Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



Technology Areas

Primary:

- TX11 Software, Modeling, Simulation, and Information Processing
  - TX11.5 Mission Architecture, Systems Analysis and Concept Development
    - TX11.5.2 Tools and Methodologies for Performing Systems Analysis

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System